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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.
IN COOPERATION WITH THE UNIVERSITY OF MISSOURI AGRICULTURAL
EXPERIMENT STATION; F. B. MUMFORD, DIRECTOR.

SOIL SURVEY OF PERRY COUNTY, MISSOURI.

BY

B. W. TILLMAN, OF THE U. S. DEPARTMENT OF AGRICULTURE,
AND C. E. DEARDORFF, OF THE UNIVERSITY OF MISSOURI,

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1913.]



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., November 2, 1914.

SIR: In the extension of the soil survey in the State of Missouri work was undertaken in Perry County during the field season of 1913. This work was done in cooperation with the State of Missouri, and the selection of the area was made after conference with State officials.

I have the honor to transmit herewith the manuscript report and map covering this area, and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1913, as provided by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

CONTENTS.

SOIL SURVEY OF PERRY COUNTY, MISSOURI. By B. W. TILLMAN, OF THE U. S.	
DEPARTMENT OF AGRICULTURE, and C. E. DEARDORFF, OF THE UNIVERSITY	
OF MISSOURI.....	Page. 5
Description of the area.....	5
Climate.....	8
Agriculture.....	9
Soils.....	15
Hagerstown series.....	17
Hagerstown silt loam.....	17
Hagerstown silty clay loam.....	19
Clarksville series.....	20
Clarksville stony loam.....	20
Clarksville gravelly loam.....	21
Tilsit series.....	21
Tilsit silt loam.....	22
Knox series.....	23
Knox silt loam.....	24
Huntington series.....	25
Huntington gravelly loam.....	25
Huntington loam.....	25
Huntington silt loam.....	26
Robertsville series.....	26
Robertsville silt loam.....	27
Sarpy series.....	27
Sarpy fine sandy loam.....	28
Sarpy very fine sandy loam.....	28
Sarpy loam.....	28
Sarpy silty clay loam.....	29
Sarpy clay.....	29
Wabash series.....	29
Wabash silty clay loam.....	30
Wabash clay.....	30
Vicksburg series.....	30
Vicksburg silt loam.....	31
Judson series.....	31
Judson silt loam.....	32
Sharkey series.....	32
Sharkey clay.....	32
Summary.....	33

ILLUSTRATIONS.

FIGURE.	Page.
FIG. 1. Sketch map showing location of the Perry County area, Missouri.....	5
MAP.	
Soil map, Perry County sheet, Missouri.	

SOIL SURVEY OF PERRY COUNTY, MISSOURI.

By **B. W. TILLMAN**, of the U. S. Department of Agriculture, and **C. E. DEARDORFF**, of the University of Missouri.

DESCRIPTION OF THE AREA.

Perry County, Mo., is in the eastern tier of counties and two-thirds the distance from Iowa to the south State line. It lies about sixty miles south of St. Louis. It is separated from Illinois on the north and east by the Mississippi River, and is bounded on the west by Ste. Genevieve, St. Francois, and Madison Counties, and on the south by Bollinger and Cape Girardeau Counties.

The county is roughly triangular in shape. From its extreme northern point south to the county line it has a maximum width of 20 miles, and its greatest length, along the southern boundary, is about 28 miles. It has an area of 462 square miles, or 295,680 acres.

Perry County comprises two physiographic divisions, the upland and the lowland. The upland is by far the most extensive, comprising about seven-eighths of the total area of the county. Its topography varies from gently rolling to hilly, the more nearly level section extending in a belt north and south through the central part of the county. The topography of this belt is undulating to rolling, and somewhat hilly along the creeks. This is the most important agricultural section of the upland, and the greater part of the more nearly level belt is under cultivation. The hilly part of the upland occurs in two belts. The eastern hilly belt extends from the southern boundary of the county north along the river valley to the vicinity of Wittenberg. It has an average width of about 4 miles, the most extensive as well as the more broken and cherty section being just south of Wittenberg. The western hilly belt varies in width from 6 to 9 miles. It extends north from the southern part of the county along the western boundary line, gradually tapering to a narrow strip along South Fork Saline Creek west of Brewer. Excluding the cherty section south of Wittenberg, the western hilly belt is much more thoroughly dissected and contains larger quantities of chert than the eastern belt.

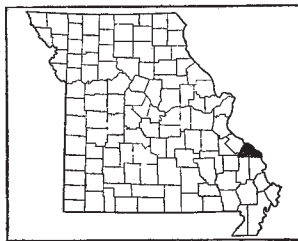


FIG. 1.—Sketch map showing location of the Perry County area, Missouri.

The upland is a part of the Ozark region of southern Missouri. Marbut¹ divides the Ozark region into the Ozark border, the Ozark plateau, and the Ozark center on the basis of the character of the country, its rock beds, and its soils. Following this classification, Perry County belongs in the Ozark border division. This is lower than the other divisions of the Ozark region, its rocks contain less flint, and the topography is less rough.

The drainage system of some parts of the county is rather poorly defined, owing to the fact that much of the water is carried by subterranean channels. The main watershed extends through the west-central part of the county in a northeast-southwest direction. The eastern central part of the county is drained by Cape Cinque Hommes Creek, the southern part by Indian Creek and other small tributaries of Apple Creek. Brazeau Creek drains the section between the Cape Cinque Hommes and Indian Creek basins, and flows into the Mississippi River at Wittenberg. The extreme southwestern part of the county is drained by the Whitewater River and its tributaries, and the western part by South Fork Saline Creek and several minor streams. Bois Brule Creek, with a number of tributary drainage ditches, drains the northern or lowland section, emptying into Cape Cinque Hommes Creek north of Menfro.

The creek bottoms are generally narrow. All the drainage of the county finds its way ultimately into the Mississippi River. All parts of the upland have sufficient slope for good surface drainage. The land immediately along the streams is in places thoroughly dissected, forming a series of narrow ridges with occasional areas of Rock outcrop. In the western part of the county, along South Fork Saline Creek, much of the land is so dissected as to be unfit for cultivation.

The Mississippi bottoms begin in the northwestern part of the county and extend as a narrow strip along the river to Cape Cinque Hommes Creek, terminating at a point about three-fourths of a mile northwest of Red Rock. In addition to this main body of lowland, there are three small islands, the Huber and Suterer Island south of Allens Landing, Willow Island north of Belgique, and Horse Island northwest of Claryville. The bottoms have been known since the earliest time as Bois Brule Bottom.

The bottoms have an average width of 4 to 6 miles, the widest part being in the vicinity of McBride. They are separated from the upland by a precipitous bluff, which is broken only by valleys of the issuing streams. The bottom land has a flat to billowy surface, except where channels have formed at times of overflow. A narrow strip of bottom land about three-fourths of a mile wide extends from Wittenberg a few miles north along the river.

¹ Soils of the Ozark Region. Research Bul. No. 3, University of Missouri.

Much of the bottom land was formerly swampy, though the construction of drainage ditches has made the greater part of it available for agriculture, and the areas still undrained are being reclaimed. Levees have been constructed along the river, and are being strengthened from time to time so as to be made a permanent protection against floods.

Surrounding Longtown there is a large area of country having subterranean drainage. The surface is marked by many gentle undulations, which are due to sinks in the underlying limestones. Sometimes streams of considerable size disappear through such sinkholes. When neglected and allowed to grow up in vegetation these apertures often become clogged and small ponds or lakes develop. With reasonable care, however, to prevent this condition the drainage is adequate, and possibly results in less waste to the land than surface drainage. In some places tile is used successfully to maintain an opening in these sinks. This reduces the waste of land which may result from standing water or erosion and at the same time insures good drainage.

The native forest growth in Perry County consists mainly of white oak, black oak, walnut, hickory, elm, sycamore, poplar, cherry, maple, and persimmon. The forest growth is confined to the much eroded section along the creeks and to the more extensive hilly areas. The timber is used for ties, rough lumber, fuel, ax handles, hoops, etc. Portable sawmills are in operation in all the principal forest areas. A swing factory is located at Wittenberg, and the manufacture of wagons at Perryville is an important industry.

The first American settlement in this region was made about 1790. The first settlers came from Pennsylvania and Kentucky. Those from Pennsylvania settled in Bois Brule Bottom, while the settlers from Kentucky were from the western part of that State, commonly known as the "barrens," and in this county they occupied the prairielike country in the vicinity of Perryville, giving it the same name. The term is still used by some of the older inhabitants of the county. Perry County was organized in 1821.

In 1839 a large colony of Germans settled in the southeastern part of the county in the vicinity of Altenburg. Another German colony was established at Wittenberg, and after the close of the Civil War additional settlements were made by Germans. A large part, about 75 per cent, of the present population of the county consists of the descendants of these German settlers.

The population has increased steadily during recent years. It is reported as 14,898 in the 1910 census. Perryville, the county seat, is the largest town. Its population is reported at 1,708. This town is situated near the center of the county, on the Cape Girardeau Northern Railway. Its growth has been quite rapid during the last

few years. Altenburg, with a population of about 300, is the next largest town in the county. Frohna, Longtown, Crosstown, Uniontown, and Wittenberg are small towns in the southeastern part of the county. Wittenberg is located on the St. Louis & San Francisco Railroad and is on the Mississippi River. Menfro and McBride are small towns on the same road, in the main bottom section. Lithium is a small health resort in the northern part of the county on the Cape Girardeau Northern Railway. Claryville is located on the Mississippi River opposite Chester, Ill. It is the terminal of the local railroad. Other villages of local importance are Belgique, Farrar, Brewer, Silver Lake, and Yount. Biehle is located on the railroad in the southern section.

The railroad facilities of the county are only fair. The St. Louis & San Francisco Railroad crosses the county, extending through the bottom land and along the banks of the Mississippi River. The Cape Girardeau Northern extends from Claryville south to Perryville and Cape Girardeau. A branch of this line connects with points in Ste. Genevieve County. No branch lines of the main road have been extended inland in Perry County, and some parts of the county are rather remote from shipping points.

The wagon roads are generally good. The main roads leading out of Perryville are macadamized or graveled. The large quantities of gravel, quartz, and limestone within the county constitute excellent road-building material. The roads generally follow contour lines, very few being located along the land lines.

The county is well supplied with rural delivery mail routes, and telephones are in common use.

CLIMATE.

The climate of Perry County is humid. The summers are long and hot and the winters short and generally mild, with occasional periods of pronounced cold. In general, the climate is well suited to general farming. The mean annual temperature is about 56° F. July and August are the hottest months and January and February the coldest. The weather during the fall is generally mild and pleasant. Zero weather rarely occurs before the latter part of December. The snowfall is light and the ground is seldom covered for any considerable length of time. Killing frosts often occur in April and May and are very damaging to fruit, especially peaches, the buds of which often swell during the mild weather in winter, only to be killed by late cold weather during the spring.

The mean annual precipitation for the county is about 46 inches. The rainfall is well distributed throughout the year. It is heaviest during the spring and summer months, or during the growing season, and lightest during the fall. The rainfall is ample for the successful

production of all the crops commonly grown in the region if proper care is taken to conserve the moisture. Extended droughts are very rare.

The average date of the first killing frost in the fall is October 13, as recorded at the Marble Hill station, and of the last in the spring, April 19. The earliest date of killing frost recorded in the fall is September 14 and the latest date recorded in the spring is May 10. There is an average growing season of approximately six months.

There is no Weather Bureau station in this county, but the data in the table below are fairly representative of the climatic conditions of Perry County.

Normal monthly, seasonal, and annual temperature and precipitation at Marble Hill, Bollinger County, Mo.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	36.2	72	- 7	3.22	3.95	2.53	.....
January.....	33.9	75	-11	3.39	1.48	4.64	.....
February.....	34.1	76	-31	3.42	2.27	2.01	.....
Winter.....	34.7	.....	.....	10.03	7.70	9.18	.....
March.....	47.4	89	3	5.07	3.81	12.68	.....
April.....	56.0	90	19	4.33	3.28	2.74	.....
May.....	65.9	93	27	4.56	1.50	6.87	.....
Spring.....	56.4	.....	.....	13.96	8.59	22.29	.....
June.....	73.7	103	39	4.60	2.64	4.87	.....
July.....	76.8	116	48	5.21	1.81	5.28	.....
August.....	76.6	104	48	3.14	4.58	3.49	.....
Summer.....	75.7	.....	.....	12.95	9.03	13.64	.....
September.....	70.6	103	24	3.61	1.40	6.45	.....
October.....	57.4	93	21	2.19	1.77	6.74	.....
November.....	45.3	84	8	3.39	1.52	1.79	.....
Fall.....	57.8	.....	.....	9.19	4.69	14.98	.....
Year.....	56.2	116	-31	46.13	30.01	60.09	.....

AGRICULTURE.

The early settlers in this region located along the streams. They lived by hunting and fishing while the first land was being cleared, and for some time very little farming was done beyond that necessary to supply food and clothing. The smoother and more productive land was selected for cultivation. Cotton, flax, and tobacco were grown for home use. Wheat was an important crop from the earliest

time. The wheat supply beyond that needed for bread was generally shipped by boat to St. Louis. Subsequently large flour mills were established along practically all the streams, and some of these are in use to-day.

The raising of live stock has never been very important in the agriculture of the county. The stock was pastured on the open range by the early settlers, and no attention was given to systematic breeding. This combination of raising live stock on unoccupied land and the cultivation of grain represents the first stage in the agricultural development of the county. It continued until 15 or 20 years after the Civil War. During the war very little development took place, but immediately thereafter the settlement of the county increased, and land was rapidly cleared and improved. The raising of stock received less attention, and grain farming became the most important form of agriculture.

Corn is now the most important crop. In 1912, according to the Missouri Crop Review for 1912, published by the Missouri State Board of Agriculture, 33,874 acres were devoted to this crop, with a total yield of 1,219,464 bushels, valued at \$524,369. The average yield is 36 bushels per acre. The acreage in corn has increased as that in wheat has decreased. The drainage of swamp land in the Mississippi bottoms has increased the acreage devoted to corn. Nearly all the surplus corn is fed to hogs. A few cornbinders are used. A large part of the crop is cut and shocked by hand. The rest is husked or snapped in the field, leaving the stalk for the cattle in winter. This practice of grazing cattle in the corn field is usually injurious to the soil. After being trampled by the stock it becomes puddled. Clods form with subsequent plowing, and if the season is dry much damage to the succeeding crop results. In the spring the corn stalks are usually cut with a cutter and plowed under. The value of corn fodder as feed is being more generally recognized. There are few silos in the county.

Of the white varieties of corn the St. Charles White, Boone County White, and Johnson County White are found to be the best adapted to this section by the Missouri Experiment Station, while the best of the yellow varieties are the Reid's Yellow Dent and Leaming. Boone County White and Leaming are large-growing varieties, and seem to be especially adapted to the bottoms.

Next to corn, wheat is the most important crop of the county. In 1910 a total of 39,419 acres was devoted to this crop, giving an average yield of 11 bushels per acre, or a total yield of 433,609 bushels, representing a value of \$377,673. In 1912 the Missouri Crop Review reports 18,354 acres in wheat, with a yield of 110,124 bushels, or an average yield of 6 bushels per acre. Maximum yields of 35 to 40 bushels per acre are reported for 1913. The greater part of the wheat

produced is ground into flour at the various mills distributed throughout the county. The upland soils, derived largely from limestone, produce a high quality of wheat. The wheat grown in the bottoms is considered by some to be of poorer quality, but the crop is more profitable because of the larger yields obtained from the bottom soils.

Farmers generally plow the land for wheat in late summer or early fall. Early summer plowing is beneficial, but is not extensively practiced, owing to the pressure of other work at this time. The harrow, disk, and roller are used in preparing the land, and the wheat is seeded with drills, usually at the rate of about $1\frac{1}{2}$ bushels per acre. The time of seeding varies from about October 10 to the first of November. Frequently late sowing is practiced to avoid injury by the Hessian fly. In a few cases farmers sow small areas early, so as to attract the fly to them, thus saving the main crop, which is sown later.

The wheat is stacked on the smaller farms, but over the greater part of the county it is thrashed out of the field. The acreage of wheat for the county as a whole has decreased during recent years, because of diminished profits. No spring wheat is grown. Of the winter wheat especially adapted to the county the Missouri Experiment Station recommends the Fulcaster and Mediterranean of the bearded varieties, and the Fultz and Poole of the smooth varieties.

Seed wheat is usually cleaned with an ordinary fan mill. There is some complaint of damage by smut.

A few farmers use a complete fertilizer on wheat at seeding time, and this practice is generally profitable, depending somewhat upon the season. As a rule complete fertilizers are beneficial, particularly on thin, impoverished lands from which immediate returns are desired. Where clover has been grown regularly, and especially where manure or some green leguminous crop, such as clover or cowpeas, has been plowed under or pastured down, there should be little need of applying nitrogen.

The oat crop is of secondary importance in this county. Oats were grown on 4,543 acres in 1912, according to the Missouri Crop Review, yielding 159,005 bushels, or an average of 35 bushels per acre. The oats are used mainly for horse feed. The yields vary widely with the season. Occasionally the crop is a complete failure. Rust and smut are very damaging. Winter oats are not grown. The Texas Red Rust Proof variety is recommended by the Missouri Experiment Station for this section of the State.

Alfalfa is grown extensively in the Mississippi bottoms, where it does particularly well. It is also grown to some extent on the small creek bottoms of the county, and its production on the uplands is receiving some attention. The better upland soils with careful management are well suited to this crop. Seeding is done in August

or the first part of September, using 15 to 20 pounds of seed per acre. Where the land has not grown alfalfa before it should be inoculated. Farm manure is always beneficial, and on medium to poor soils it is necessary for successful alfalfa growing.

Red clover is the most important hay and forage crop of the county. The farmers have not been slow to recognize its value in the crop rotation, and it is largely due to the extensive growth of clover that profitable yields of grain crops have been maintained for so long a time. Its value in increasing the nitrogen supply and in improving the physical condition of the soil is being more generally appreciated. But, as in other sections of the country, the growing of red clover is apparently becoming more difficult. An impression prevails that success in getting clover started depends, to some extent at least, on the early summer season, particularly the rainfall during June and July. Almost invariably, however, the soil of areas where clover does poorly or fails is in need of lime or organic matter, or both.

During the last few years cowpeas have been grown extensively in an effort to obtain a leguminous crop to replace clover. The crop is grown to some extent in all parts of the county, and produces good yields. The drilling of cowpeas in corn is practiced to a considerable extent. When sown alone a good method is to drill them with an ordinary grain drill, using about 1 bushel per acre. The cowpeas may be seeded from late May to early July. The Whippoorwill, Clay, and New Era are well adapted to this region.

Rye is grown to a limited extent. It is used as a nurse crop, as pasture, and as a cover crop. It is a good cover crop, and could with advantage be grown more extensively for this purpose in sections where soil erosion is an important problem.

Timothy is not extensively grown. With increasing attention to the raising of live stock the acreage of this crop increases.

Sorghum and tobacco are grown to some extent. According to the 1910 census, sorghum was grown on 378 acres in 1909, with a production of 20,950 gallons of sirup. Tobacco was grown on a total of 8 acres, with a yield of 8,753 pounds.

The live-stock industry has been of only secondary importance in the county. It is receiving increasing attention, however, the extension of the industry accompanying the increase in corn production. The total value of domestic animals is reported as \$623,270 in the census of 1900. In the 1910 census it is given at \$1,244,777. The stock runs at large on the public roads and the range land.

The cattle are mainly grade Shorthorns or Herefords, there being very few pure-bred cattle. In a few localities the cattle are of good quality, but for the county as a whole they are medium to poor. With the introduction of pure-bred bulls, a general improvement in the quality of the live stock is being made.

Only a few farmers feed cattle for market. As a rule enough stock is kept to consume all the surplus grain and rough feed produced on the farm.

Hog raising is the most important phase of the live-stock industry. There are several pure-bred herds in the county, and the stock in general is being improved. The hogs are mainly Chester Whites, Duroc Jerseys, Poland Chinas, and Berkshires. The development of the hog-raising industry has been seriously retarded by the prevalence of hog cholera. The absence of stock laws is also detrimental. Much attention is now being given to the prevention of hog cholera by vaccination.

Practically all farmers have a few horses or mules to market each year. The mules are of excellent quality. The quality of the horses in general is below that of the mules. There is a need for the introduction of larger and better bred stallions.

Dairying is not extensively practiced, but is becoming an important industry. Creameries are established in different parts of the county, and additional interest is being taken in the marketing of dairy products. In general the tendency in Perry County is apparently from a pure system of grain farming to one of dairying. Such a change, however, is necessarily slow, and involves a change in the cropping system.

The county is well adapted to dairying. There is an abundance of clear, fresh water, often in the form of cold springs. The winters are mild, with plenty of sunshine. There is little danger of disease, and the expense involved in providing buildings and feed is small. Good markets are available, and there is a good local demand for dairy products. There are, however, but few pure-bred bulls of dairy breeds in the county, and there is a general need throughout for the improvement of the stock.

Poultry is kept on all the farms, and constitutes an important source of income. Large flocks of turkeys, ducks, and geese are kept. The rougher, hilly areas are ideally suited to the raising of poultry. Owing to the demand for poultry products and the comparatively low selling price of land in the rougher areas, the development of the poultry industry offers an attractive opportunity.

There are several successful commercial orchards in the county, and apples and peaches are grown on practically all the farms. The local demand for fruit is well supplied. Scientific methods of management are practiced in some of the large orchards, but little or no systematic care is given the trees of the small orchards. Insect pests and fungus diseases are prevalent. The soils, especially the Knox and the Hagerstown silt loams, are well suited to fruit growing, and good markets for the products are available. The climatic conditions, however, are not particularly favorable. The frequent

occurrence of late spring frosts makes the growing of apples and peaches, especially the latter, somewhat too uncertain to warrant making it an exclusive industry. Fruit growing, however, is profitable where carried on as a part of a varied system of farming. The value of all orchard products, including small fruits and nuts, is reported in the 1910 census as \$56,682.

Small fruits are grown only for home consumption. Irish and sweet potatoes do well. Of the former, a production of 57,540 bushels from 883 acres is reported in the 1910 census. A total of 90 acres is reported in sweet potatoes, with a yield of 10,617 bushels.

The cultural methods in Perry County are generally good. Pasture lands are generally plowed in the fall. Corn land when sown to wheat is usually disked and harrowed. The practice of fall plowing on land where there is no danger of erosion is a commendable one. It enables the soil to store the winter moisture for use the next summer, and the alternate freezing and thawing loosens the soil, and gives it better tilth, permitting the free circulation of air.

With the increase in the number of live stock in the county additional quantities of manure are being produced, and this is more or less carefully preserved and returned to the land. One application of manure or the plowing under of one green leguminous crop results in increased crop production for several years.

Some form of crop rotation is usually practiced with clover as the legume. It is necessary for each farmer to adopt a rotation which as nearly as possible meets the requirements of his farm and soils. Whether or not grain farming, which is so extensively practiced in the county, will continue to be profitable for any extensive period depends to a very large degree upon the care and attention the soil receives. In the more hilly sections grain farming on an extensive scale is impossible. But the topography and soils of most of the uplands as well as of the bottom lands are well suited to the production of grain.

In some places considerable soil erosion has taken place. Erosion has been most active within areas of the Tilsit silt loam and in other areas where the organic-matter supply has become depleted. Soils having a high organic-matter content do not erode so easily. The use of cover crops to prevent soil washing during the winter is given little attention.

Land values vary considerably in different parts of the county. The land in rough sections with only small cultivable areas sells for \$12 to \$25 an acre. In the better upland areas it is valued at \$75 to \$100, and in the bottoms may sell at \$125 an acre. Over a large part of the upland land sells for \$40 to \$60 an acre.

The region as a whole is one of farm owners. According to the census of 1910, 76.6 per cent of the farms are operated by owners.

Excluding the Mississippi bottoms, the average is much higher than this. The average size of the farms is 133.4 acres.¹ Where the farms are operated by tenants, the rent in the upland varies from \$2.50 to \$6 an acre, while the bottom-land farms are rented for \$5 to \$8 an acre.

As a rule it is difficult to secure farm labor, although the labor problem is not as serious as in some other parts of the State. Labor-saving machinery is used where possible. Monthly wages vary from \$20 to \$35 per month, with board and lodging. Day laborers receive from \$1.50 to \$1.75 a day.

A condition of general prosperity prevails throughout the county. In the better farming sections the farm buildings are mainly substantial two-story structures and are kept in good repair.

The general tendency in Perry County is toward a more systematic and scientific agriculture.

SOILS.

The soils of Perry County are classed in two general groups, the upland soils and the lowland soils. The upland soils are residual, largely from limestone, with the exception of narrow strips of loessial soil, mapped as the Knox silt loam.

The uplands include four principal rock beds which have given rise to three soil series. Beginning on the east along the Mississippi Valley the first rock belt is a massive, crystalline, pure, hard limestone containing much chert. The next layer westward is the Trenton limestone, which is a rather pure limestone free from chert, and gives rise largely to the rolling to level belt of country extending through the east-central part of the county. West of this occurs the Crystal City sandstone. This is rather thin bedded, and consists of a yellowish siliceous sandstone which disintegrates readily when exposed to weathering. The layer thins out westward until it completely disappears or is represented only by remnants of the original bed. The next layer westward in the descending series is a limestone, probably the Jefferson City limestone. It outcrops in the southwestern part of the county. Fragments of sandstone are found over the area occupied by this latter formation, and this indicates that a thin layer of the main sandstone formation at one time covered the entire southwestern part of the county. This is evidenced not only by the occurrence of the sandstone fragments, but also by the fact that the soil material is the same as that of the sandstone area to the east. This soil, however, occurs only on the tops of the sharp ridges, the slopes of which are cherty.

From an economic standpoint the Trenton limestone is the most important rock formation in the county. It constitutes an excellent

¹ The census tabulates each tenancy as a farm. The individual holding may be greater than this.

roadbuilding material, and is used extensively in other regions for manufacturing cement and for building purposes. It is also used to some extent as a soil amendment in different parts of the country and promises to become important for this purpose in Perry County.

The uplands comprise about seven-eighths of the total area of the county. They include four soil series, the Hagerstown, Clarksville, Tilsit, and Knox. The residual soil material in some places has a depth of 25 to 30 feet, the greatest thickness occurring on the chert-free limestone. In case of the Tilsit soil there is apparently some influence from the common underlying sandstones, but the greater part of the material is evidently derived from limestone.

The Hagerstown and Clarksville soils are residual from limestone, the latter from cherty limestone.

The Knox silt loam is a loessial soil. It is not very extensive and occupies narrow strips on the bluffs of the Mississippi Valley, extending from the vicinity of Wittenberg to the Ste. Genevieve County line.

The alluvial soils derived from wash from the upland types are classed with the Huntington series (first-bottom soils), consisting of alluvium mainly from the Tilsit, Hagerstown, and Clarksville soils; the Robertsville series (second-bottom soils), from the same source, and the Vicksburg series, consisting of alluvium from the Knox soils. The Mississippi alluvial soils represent three series, the Wabash, Sarpy, and Sharkey. The Mississippi lowland is protected by levees which are being strengthened from time to time in order to afford permanent protection against floods.

In this county 20 soil types, representing 11 soil series, are recognized. The various types are described in detail, and their relations to agriculture brought out in subsequent chapters. The soil map accompanying this report shows their distribution.

The following table gives the names and the actual and relative extent of the various soil types mapped in Perry County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Hagerstown silt loam.....	75,968	36.1	Wabash clay.....	4,352	1.4
Hilly phase.....	28,928		Sharkey clay.....	4,224	1.4
Sink-hole phase.....	1,664		Sarpy very fine sandy loam...	3,520	1.2
Tilsit silt loam.....	66,880	22.6	Sarpy fine sandy loam.....	3,072	1.0
Knox silt loam.....	21,056	7.1	Huntington gravelly loam....	2,880	1.0
Clarksville stony loam.....	19,296	6.5	Vicksburg silt loam.....	1,728	.6
Clarksville gravelly loam....	15,200	5.2	Robertsville silt loam.....	1,664	.6
Huntington loam.....	11,520	3.9	Wabash silty clay loam.....	576	.2
Huntington silt loam.....	10,816	3.6	Sarpy silty clay loam.....	448	.2
Hagerstown silty clay loam...	10,048	3.4	Judson silt loam.....	192	.1
Sarpy clay.....	6,336	2.1			
Sarpy loam.....	5,312	1.8	Total.....	295,680	.....

HAGERSTOWN SERIES.

The surface soils of the Hagerstown series are prevailingly brown. The subsoils are light brown or yellowish brown to dull red. These soils are typically developed in the limestone valleys of the Appalachian Mountain region, in the central basins of Kentucky and Tennessee, and in the eastern part of the Ozark region, with smaller areas in many other parts of the eastern United States. The material is residual from limestone. Fragments and outcrops of limestone are of common occurrence. The topography is undulating to gently rolling. In this county two members of this series are recognized, the silt loam and silty clay loam.

HAGERSTOWN SILT LOAM.

The Hagerstown silt loam is a pale yellowish brown to light-brown silt loam, underlain at about 8 to 15 inches by a reddish-yellow to yellowish-brown or light reddish brown, friable silty clay loam which quickly grades into reddish-yellow or reddish-brown to yellowish-brown fairly stiff clay. This clay, when only moderately moist, has a rather brittle or crumbly structure. The subsoil contains many black and brown iron stains. The silt loam surface layer is deepest on the smoother areas of the higher situations. In spots on the slopes the surface material has been washed away, leaving a silty clay loam at the surface. These spots can not be shown separately on the soil map on account of their small size and irregularity of occurrence. The presence of these small patches of silty clay loam in association with the lighter colored silt loam causes freshly plowed fields to have a spotted grayish or reddish appearance.

This type occurs as a belt varying from about 4 to 10 miles in width and extending in a general north and south direction through the east-central part of the county. This is the most extensive soil in the county, covering, with its two phases, over one-third the area. The subsoil rests directly upon the rock, which is encountered usually at a depth of 20 to 30 feet, depending on the extent of erosion.

The Hagerstown silt loam is derived from the Trenton limestone. The topography is rolling, and broken to hilly along the creeks. Nearly all the land is in cultivation. In places there are numerous gentle undulations, resulting from sinks in the underlying limestone.

Wheat is the principal crop grown on this type, with corn, clover, oats, and cowpeas next in importance. It is estimated that about 40 per cent of the cultivated land of this type is seeded to wheat. The average yield of the crop for 1913 was about 16 bushels per acre. Maximum yields of 25 to 35 bushels are reported.

Although the Hagerstown silt loam, being a rich, deep soil of excellent physical properties, is well adapted to the production of grain

crops, the present system of farming does not tend to maintain its productive capacity for any considerable length of time. Like the greater part of the upland soils, this type is in need of lime, careful manuring, and the plowing under of leguminous crops such as clover, cowpeas, and soy beans. The use of the leguminous crops increases the supply of nitrogen in the soil, making the purchase of this expensive element of plant food in the form of commercial fertilizers unnecessary, or at least materially reducing the quantity needed. The physical properties of the soil are improved, the danger of erosion is lessened, and the soil is made more retentive of moisture.

Alfalfa can be grown with proper management, but this crop is not as well suited to a grain-farming system as red clover, owing to the difficulty in getting it started. It is a valuable crop where dairying is practiced.

Land of this type of soil is valued at \$75 to \$100 an acre, depending on location.

Hagerstown silt loam, sink-hole phase.—This phase includes those areas in which the surface has been modified by erosion resulting from the formation of sink holes. Owing to the presence of numerous rounded sink holes the topography is billowy, the slopes of the higher areas between the sink holes being rather steep, so that most of this type is not suitable for plowing. Limestone outcrops are common, but there are not many loose rock fragments. The soil is generally shallow, clay frequently occurring at the surface. Much of the soil in areas subject to erosion consists of grayish-yellow to reddish clay.

The phase occurs in small areas throughout the Hagerstown silt loam, and most of the farms on this type contain small patches of this land. It is used mainly as pasture, and can easily be converted into farm woodlots. The forest growth consists mainly of post oak and white oak.

Hagerstown silt loam, hilly phase.—The hilly phase consists of a yellowish-gray to gray silt loam, underlain at about 6 to 12 or 15 inches by pale-yellow to yellowish-brown friable silty clay loam. This grades at about 15 to 20 inches into a pale-yellow to yellowish-brown crumbly silty clay, which is usually mottled with gray. Often there is a faint reddish cast to the subsoil material, although in the typical areas the subsoil is distinctly yellow with gray mottling. While much of the type ranges very close in physical characteristics to the main type, the subsoil is lighter in texture and more yellowish, and there is more gray mottling than in the subsoil of the typical Hagerstown silt loam. The boundary between this phase and the typical soil in many places is difficult to establish satisfactorily owing to the fact that this soil grades almost imperceptibly into the typical. In places the line of separation is necessarily arbitrary.

This phase is developed in the eastern part of the county in the vicinity of Farrar, to the south and southeast of this place, and adjacent to the bluffs of the Mississippi bottoms, except where the loessial material occurs. In places it is rather completely dissected near the bluffs where many of the slopes are too steep for cultivation.

The hilly areas of this type support a forest growth consisting mainly of post oak, white oak, black oak, hickory, and elm. The topography is unfavorable to extensive grain farming and the phase is somewhat inferior agriculturally to the main type. Corn, wheat, clover, and cowpeas are the principal crops grown and good yields are obtained under proper management. The deep, silty character of the soil renders it especially well suited to fruit growing, and owing to its topography much of the phase is best used for this purpose. It is also well adapted to grasses, and where pasturing on the steeper slopes can be supplemented with forage crops grown on the cultivated areas, there is an excellent opportunity for dairying. Although the crop is not grown on this phase the soil is adapted to alfalfa.

Much of the Hagerstown silt loam, hilly phase, carries on the surface an appreciable amount of Knox silt loam, or loessial material, which has increased its silty nature and also its agricultural value.

This land sells for \$40 to \$75 an acre, depending upon the topography and improvements.

HAGERSTOWN SILTY CLAY LOAM.

The Hagerstown silty clay loam is a reddish-yellow to reddish-brown silty clay loam, which passes at about 8 to 10 inches into reddish-brown or reddish-yellow to yellowish-brown, brittle, or moderately crumbly clay. This underlying material is frequently mottled with gray below a depth of about 20 inches. There are places, particularly in the smoother situations on the crests of ridges, where there is a shallow covering of grayish silt loam, but this is rarely over 4 or 5 inches deep. A somewhat heavier equipment is necessary to break the land than is required on the Hagerstown silt loam, owing to the denser nature of the soil. This soil also has a greater tendency to form clods than the silt loam type. The surface soil of this type is similar to the subsoil of the Hagerstown silt loam.

The Hagerstown silty clay loam occurs in the southern part of the county, along Apple Creek, extending from Uniontown to the vicinity of Altenburg. There are also small, irregular areas along the streams in different parts of the county. Rock outcrops are numerous near Apple Creek.

The soil of this type is residual from limestone. The grayish mottling of the lower subsoil is believed to be the result of incomplete oxidation, caused by poor aeration. The topography of this

soil is considerably more uneven than in the case of the Hagerstown silt loam.

A smaller percentage of this soil is in cultivation than of the Hagerstown silt loam. The type is devoted almost exclusively to grain growing, with wheat as the main crop. It does not produce as large yields as the silt loam in its present condition, but its productive capacity is greatly improved by careful management. Its greatest need is organic matter, the addition of which improves the structure of the soil and increases its nitrogen supply. The too frequent cutting of clover and cowpeas for hay is a heavy drain on this land. The incorporation of large quantities of organic matter with this soil renders it capable of retaining a uniform moisture supply. The growing of cowpeas for seed is profitable on this type.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Hagerstown silty clay loam:

Mechanical analyses of Hagerstown silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
343103.....	Soil.....	0.0	0.2	0.4	0.6	4.2	66.6	27.7
343104.....	Subsoil.....	.0	.2	.1	.5	2.7	64.6	31.4

CLARKSVILLE SERIES.

The surface soils of the Clarksville series are gray, with yellow subsoils and red substrata. The depth of the red material varies with the topography, being greatest in the more nearly level areas. Cherty material is usually present in varying quantities in these soils, large areas being very gravelly. In the smoother areas chert and stone are less abundant. These soils in places are derived from cherty limestones. Those areas carrying but little chert are apparently derived from limestone which originally carried less chert than that giving rise to the gravelly and stony areas. The Clarksville series is typically and extensively developed in northern Alabama, Tennessee, and Kentucky. In Perry County, Mo., it is represented by two types, the stony loam and gravelly loam.

CLARKSVILLE STONY LOAM.

The Clarksville stony loam is a light-gray silt loam, which grades quickly into pale-yellow silt loam. The subsoil consists mainly of chert fragments, and a small percentage of reddish clay. Usually it is impossible to bore to a depth of more than 6 to 12 inches. Large quantities of angular fragments of chert ranging up to 6 or 8 inches in diameter are scattered over the surface and disseminated.

throughout the surface soil, the quantity being greatest where the surface is more rolling or steeply sloping.

This type characteristically occurs on steep slopes and in rolling country near the streams where erosion has been active. The forest growth consists principally of white oak, post oak, black oak, and black hickory.

The material is residual from cherty limestone. The type is largely unfit for cultivation and mainly is of value only for pasture and for the timber which it supports.

CLARKSVILLE GRAVELLY LOAM.

The Clarksville gravelly loam differs from the Clarksville stony loam mainly in the smaller size and amount of chert fragments present. The type carries from 15 to 30 per cent of gravel.

This type is developed in the extreme southeastern and southwestern parts of the area and is closely associated with the Clarksville stony loam. It is a much better agricultural soil than the stony loam. The greater part of it is suitable for agriculture, although in some places the steepness of the slopes prohibits cultivation.

Corn and wheat are the principal crops grown, and fair yields are obtained. Extensive grain production is impossible on this type, and sufficient feed can not be produced to warrant the keeping of much live stock. The section occupied by this soil affords many natural advantages for the raising of poultry. The topographic features and good drainage and an abundance of pure fresh water are favorable for poultry raising, which is a profitable industry.

The extensive growing of leguminous crops is necessary to maintain the productive capacity of this soil. On account of its open, porous structure the soil dries out quickly in dry seasons.

TILSIT SERIES.

The Tilsit soils range from pale yellow or light brownish yellow to gray, with brownish-yellow subsoils. The soils in the lower part have a faint reddish tinge with mottlings of yellow, gray, and brown. These soils differ from the Dekalb in having a relatively smooth topography, in their more intimate association with limestone soils, and in their brownish-yellow color. Their topography is undulating to hilly, but not mountainous. The material is derived from fine-grained sandstones and is modified to some extent by material derived from the overlying limestone beds. In some cases the sandstones are interbedded with the limestones of the limestone valleys and upland province. The silt loam is the only member of the Tilsit series recognized in Perry County.

TILSIT SILT LOAM.

The Tilsit silt loam in its typical development consists of a pale yellowish brown to light grayish brown, floury silt loam, underlain at about 6 to 8 inches by a yellow silt loam to silty clay loam which in places has a slight reddish cast. At a depth of 12 to 24 inches a yellow, friable silty clay is encountered. This is mottled in the lower part of the 3-foot section with yellowish brown and gray and is rather stiff and plastic. On eroded slopes the yellow silty clay loam is nearer the surface, frequently being exposed. Freshly plowed fields along the slopes usually have a spotted yellowish and grayish appearance, the yellowish spots representing those areas from which the original grayish material has been washed. Limestone and chert fragments are of common occurrence, especially near the line of contact with the Clarksville soils.

The type is typically developed in the vicinity of Highland. Along some of the slopes, where the sandstone is near the surface or outcrops, the soil contains more or less fine sand, but areas of this kind are very small in extent and differ but little in economic importance from the typical soil. In the western part of the county the type is confined to the tops of narrow ridges. The slopes of these ridges are cherty and are mapped as either the gravelly loam or stony loam of the Clarksville series, depending upon the amount and size of the chert fragments present. In some places in the western part of the county the soil of the ridges contains a sufficient quantity of sand to make it a loam, but, as in the case of the steeper sandy slopes, such areas are too small and irregular to be shown separately on the map.

The sandstone formation doubtless formerly covered the entire western part of the county, as is evidenced by the occurrence of sandstone fragments throughout this section. The lack of any distinct sandy texture of the soil material, however, indicates that the Tilsit soil is derived largely from limestone, although there is probably some influence from the sandstone which underlies it in some places. If any large part of the material came from sandstone the texture would be more sandy.

The surface of the main body of the Tilsit silt loam is gently rolling. With the exception of the western areas, all of the type is topographically well suited to cultivation. The surface drainage is thorough. The soil is low in organic matter and, largely because of this fact, it is badly eroded in places. The western areas of this type are so thoroughly dissected by narrow valleys and ravines and contain so much chert material along the slopes that only small areas on the tops of the ridges can be cultivated. In some places the fields have a ragged appearance, due to gullying. Along its northern extension the

type contains some loessial or silty material which apparently gives the land a higher agricultural value.

The average crop yields on this type are lower than on the other silty types of the uplands. Wheat, corn, clover, and cowpeas are the principal crops. Some of the farm buildings, including the houses, are in poor condition. It is not uncommon, however, to find striking contrasts, not only as to the character of the improvements but also as to the productive capacity of the soil of this type, between adjoining farms, due mainly to difference in past management. On the whole this soil offers splendid opportunities for profitable improvement. Where the organic-matter supply has once become largely depleted, in due time devastation will result from erosion unless this deficiency is corrected. Through a proper rotation with the growing and plowing under of leguminous crops and the careful preservation and use of manure this soil can be kept in a high state of productivity. It is not a good practice to grow more than one crop of corn in a rotation period of 4 to 5 years. The growing of winter cover crops is necessary wherever there is the slightest danger of erosion. Rye is well suited for this purpose. This crop may be pastured and later plowed under in the spring, unless desired for harvest. By increasing the phosphoric acid content of this soil, increased yields are secured.

Land of this type sells for \$30 to \$60 an acre, depending upon the location and improvement.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Tilsit silt loam:

Mechanical analyses of Tilsit silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
343101.....	Soil.....	0.7	1.4	0.9	1.2	2.3	79.3	13.7
343102.....	Subsoil.....	.2	.6	.6	1.1	1.4	65.9	29.7

KNOX SERIES.

The soils of the Knox series are light brown to yellowish brown, with a reddish tinge when moist. The subsoils are lighter in color than the soils, usually yellowish to yellowish brown. Typically the texture of both soil and subsoil is about the same and the subsoil is free from mottling. They are derived from the weathering of loess or other deposits high in silt and free from stones. They occur mainly in the prairie States, reaching their typical development in the hilly belts adjacent to the valley of the Missouri River in Kansas, Missouri, Iowa, and Nebraska. In Perry County the series is represented by the silt loam.

KNOX SILT LOAM.

Typically the soil of the Knox silt loam consists of a pale yellowish gray or light-brown silt loam which passes at a depth of about 6 inches into a pale-yellow silt loam. At a depth of about 24 to 30 inches a yellowish-brown, friable heavy silt loam to silty clay loam is generally encountered. In some places the soil mantle, including the soil, subsoil, and substratum, is 40 to 50 feet deep.

The type is easily recognized by its uniformity in color and texture and the absence of any rock outcrop except where deeply dissected by streams. It is believed to be loess or wind-deposited glacial material. This material is superimposed upon limestone or upon material derived from limestone. The deposit in this section formerly extended much farther inland than it does at the present time, the material having been largely washed from the inland areas. This is evidenced by the occurrence of small bodies of the type at considerable distances west of the main deposit. The formation is thickest near the Mississippi River bluff and gradually becomes thinner westward until it disappears.

The Knox silt loam is extensive in Perry County. It lies in a broad strip along the Mississippi River north of Wittenberg and in a narrower strip paralleling it from Red Rock to the Ste. Genevieve County line.

The topography is rolling or gently rolling to hilly. Some areas of the type along the steeper slopes of the streams are too steep for safe cultivation, but the higher areas comprise good agricultural land, the soil ranking among the best upland soils of the county. Only the hilly areas are forested. In some places the deeper subsoil contains grayish material, the type resembling in this respect the Memphis silt loam of other areas. Surface drainage is frequently excessive.

Corn, wheat, clover, and cowpeas are the principal crops on this type. It is a strong corn soil, yields of 60 to 70 bushels per acre sometimes being obtained. Clover does exceptionally well. The type is probably better adapted to alfalfa than the other upland types. It is recognized as an excellent fruit soil wherever it occurs. There are only a few commercial orchards on the type in this county, but the trees in these orchards as well as in the small farm orchards do remarkably well.

The Knox silt loam is a deep, well-drained soil, and is not excelled by any of the upland types in natural productiveness. The soil is mellow and easily cultivated, but is generally in need of organic matter. This can be supplied by growing legumes and applying manure.

HUNTINGTON SERIES.

The Huntington soils are light brown to brown, and the subsoils are yellow to light brown. Frequently there is little change in the color or character of the material from the surface downward throughout the soil section. These soils are developed in the first bottoms of streams, where they are subject to overflow. As a rule they are well drained. They consist generally of material derived from limestone, sandstone, and shale soils. Three types of the Huntington series, the gravelly loam, loam, and silt loam, are encountered in Perry County.

HUNTINGTON GRAVELLY LOAM.

The Huntington gravelly loam is a first-bottom soil developed along the small creeks in the western part of the county. It is of a heterogeneous nature and consists of alluvial and colluvial materials. The colluvial material is washed from the steep slopes flanking the streams to the bottom land, where it is mixed with the alluvium deposited by the streams.

To a depth of 8 to 15 inches this soil is a brown silt loam or loam containing about 15 to 20 per cent of gravel. Below this surface layer a gravelly loam, containing as much as about 30 per cent of gravel, is encountered. The lower substratum in some places consists almost wholly of gravel and broken rock material. Most of the type is flat, but occasionally there is a gradual slope from the adjoining hills to the stream bed. Narrow strips of Clarksville gravelly loam often occur along the steeper slopes adjoining the Huntington gravelly loam.

The type originally supported a heavy growth of white oak, black oak, water oak, elm, sycamore, and cottonwood. All of it is now under cultivation. It produces heavy yields of corn and wheat, corn being the principal crop. Timothy and clover do well, but owing to the danger of overflow in the spring, the growing of these crops is difficult.

HUNTINGTON LOAM.

The soil of the Huntington loam consists of a brown, friable loam. The subsoil is usually yellowish brown, but otherwise there is little change in the 3-foot section. The type includes some areas in which the subsoil is reddish brown. A few patches are noticeably sandy, and some carry considerable chert gravel. One of the sandy areas is that in the bottoms of Cape Cinque Hommes Creek just south of Perryville, where the material consists of a grayish-brown to yellowish-brown loamy fine sand underlain by a lighter colored loamy fine sand or fine sand. This area really represents a development of the Huntington fine sand, which type was not established on account of its small extent.

The Huntington loam is most extensive in the bottoms of streams rising in or flowing through the Tilsit soil.

Like the Huntington silt loam, this type is an excellent corn soil, and is devoted largely to the production of this crop. The other crops common to the region do well, but are not grown extensively. The type is also well adapted to alfalfa where it is not subject to frequent overflow. Owing to its warm, porous nature it is well suited to truck crops. The yields of corn vary from about 40 to 70 bushels per acre. Under the present system of farming corn is probably the most profitable crop that can be grown.

HUNTINGTON SILT LOAM.

The Huntington silt loam is a light-brown, mellow silt loam which typically is without change in the 3-foot section, with the exception of occasional mottlings of gray in the lower subsoil, or grades into a fairly compact, yellowish-brown silt loam. In many places, particularly in the higher bottoms, the subsoil has a reddish cast. The type occupies first bottoms along the streams.

The material consists of alluvium or wash from the upland soils, such as the Hagerstown, Clarksville, and Tilsit. The surface is generally level, but there are some included gentle slopes along the outer margin, where alluvial material has been brought down from adjoining slopes. In some places, as in the first bottoms of Dryden Creek, considerable gravel is present.

Corn is the principal crop grown, and yields of about 50 to 75 bushels per acre are obtained under favorable conditions. Owing to its mellow character and high organic-matter content this is an excellent agricultural soil. The type is overflowed occasionally in early spring, receiving additional layers of rich soil material. All of the type is in cultivation. Alfalfa does well in areas which are not flooded too frequently. Probably its best use under the present system of farming is for corn.

The value of this type can not be estimated, as it is always farmed in connection with other soils.

ROBERTSVILLE SERIES.

The Robertsville soils are gray to grayish brown and prevailingly of silty texture. The subsoils typically consist of a gray to white compact layer of silt loam to silty clay loam, overlying a lower subsoil stratum of compact, impervious, plastic clay of a gray to brownish color, with some faint mottling of reddish brown. Black oxide of iron concretions are common throughout the soil section, particularly in the lighter colored, more poorly drained situations. The flat surface and impervious subsoil cause many areas to be poorly drained. These soils represent old stream alluvium occupying ter-

racess and abandoned stream valleys no longer subject to overflow. The soil includes material washed principally from limestone, sandstone, and shale soils. In Perry County only one member of this series, the Robertsville silt loam, is encountered.

ROBERTSVILLE SILT LOAM.

The Robertsville silt loam consists of a gray floury silt loam, underlain at about 15 to 18 inches by a mottled yellowish-brown and light-gray, rather friable silty clay loam to silty clay which passes below into a yellowish, plastic clay mottled somewhat with gray. Some black oxide of iron concretions are present on the surface and throughout the soil section. The type occupies level terraces about 10 to 15 feet above the first bottoms of associated streams.

The material consists of alluvium which was deposited by stream overflow at an earlier stage in the development of the drainage ways when the waters reached higher levels. Imperfect drainage accounts for the grayish and mottled colors.

The type is typically developed along Apple Creek in the southeastern part of the county and along South Fork Saline Creek west of Brewer. The largest area occurs along Apple Creek and comprises about 1,000 acres. The surface of this type is flat and the soil is very poorly drained. Its productive capacity can be materially increased by artificial drainage.

Timothy, bluegrass, and white clover do well on this type. It is better adapted to alsike than to red clover because of its poor drainage.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Robertsville silt loam:

Mechanical analyses of Robertsville silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
343105.....	Soil.....	1.6	1.3	0.5	0.8	6.6	72.5	16.2
343106.....	Subsoil.....	.0	.1	.2	.3	2.3	49.7	47.1

SARPY SERIES.

The soils of the Sarpy series range from light gray to brownish gray in color. The subsoils are gray to pale yellowish in color. They differ from the Wabash and Yazoo soils in having loose silty or fine sandy subsoils, distinctly lighter in texture than the surface soils. This series is developed in the bottoms of the Mississippi and Missouri Rivers and their larger tributaries. The material is alluvial in origin. Owing to their low position these soils are subject to overflow,

although between the flooded stages of the streams the nature of the soil and subsoil is such that drainage is thorough to excessive. In general, the topography is flat. The Sarpy fine sandy loam, very fine sandy loam, loam, silty clay loam, and clay are recognized in Perry County.

SARPY FINE SANDY LOAM.

The Sarpy fine sandy loam is a light-brown fine sandy loam, underlain at about 3 to 6 inches by a grayish loose fine sand to very fine sand, which extends beyond a depth of 3 feet. In some places the subsoil contains thin layers of soil of different texture.

This is an alluvial type developed along the Mississippi River. The soil is well drained and easily cultivated, and is very productive where the supply of organic matter is maintained. Excellent yields of corn and wheat are obtained and the type is well adapted to alfalfa. It is an excellent trucking soil, but is not used extensively for this purpose because of the remoteness of the large markets. Yields of 70 to 80 bushels per acre of corn are frequently obtained on this type. It is still in process of formation along the river by addition of deposits from overflow. The Sarpy fine sandy loam is not very extensive in this county.

SARPY VERY FINE SANDY LOAM.

The Sarpy very fine sandy loam is developed as a narrow strip along the Mississippi River from near Allens Landing to the Ste. Genevieve County line. It consists of a light-brown to grayish-brown very fine sandy loam which passes below into a loose very fine sand. Corn and alfalfa are grown extensively, and both crops produce large yields. All of the type is in cultivation. This soil covers about $5\frac{1}{2}$ square miles in Perry County.

SARPY LOAM.

The Sarpy loam is a brown or dark-brown loam underlain at depths of about 6 to 18 inches by a yellow or yellowish-brown fine sand or very fine sand, or somewhat heavier material of the same general character. The texture varies in places to fine sandy loam on the one side and to silt loam or silty clay loam on the other, such variations being too irregular in occurrence or too small in extent to be indicated on the soil map.

This type occurs in the higher, better drained areas of the bottoms, occupying the swells, hummocks, and relatively high flats. Usually the surface is not level, but is more or less hummocky or billowy.

The Sarpy loam is a somewhat better soil than the Sarpy clay, its lighter surface texture giving it better aeration and warmth and making it easier to till. The type is ideally adapted to wheat, corn, and

alfalfa. These crops are grown extensively and produce excellent yields. Yields of 40 bushels per acre of wheat are sometimes reported.

The average yield of wheat, however, is probably between 20 and 25 bushels per acre. All of the type is in cultivation.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Sarpy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
343119.....	Soil.....	0.1	1.0	3.3	26.7	23.0	34.9	10.8
343120.....	Subsoil.....	.0	.0	.1	11.9	42.0	36.5	8.9

SARPY SILTY CLAY LOAM.

The Sarpy silty clay loam consists of a rather dark brown, friable silty clay loam, underlain at about 5 or 6 inches by yellowish-brown silty clay loam which grades below into yellow or yellowish-brown fine sandy loam or very fine sandy loam. In places there is a layer of silty clay over the lighter textured lower subsoil material.

The type is not very extensive. It is a Mississippi River bottom soil, separated from the river by the Sarpy fine sandy loam. The surface is smooth. The type is well drained and produces excellent yields of all crops common to the region.

SARPY CLAY.

The Sarpy clay is a dark-brown clay which grades into lighter brown clay at about 6 to 8 inches. Between depths of about 8 and 30 inches lighter textured, yellowish, friable material is encountered. This varies from silty clay loam in the upper part to fine sandy loam, very fine sandy loam, fine sand or very fine sand in the lower part of the 3-foot section. The lighter deep subsoil has the effect of giving the soil thorough drainage.

This soil is alluvial in origin. It occurs in the Mississippi bottoms. It is used mainly for wheat and corn, and excellent yields of both crops are obtained. Wheat produces maximum yields of 40 bushels per acre. Where well drained the type is well suited to alfalfa. It is one of the strongest bottom soils of the county.

WABASH SERIES.

The Wabash soils are prevailingly black, ranging to dark brown, and contain a high percentage of organic matter. The subsoils are drab or gray. These soils are developed in the first bottoms of

streams in the central prairie States. They extend for long distances along the Mississippi River. The material is derived mainly from the calcareous drift material and loessial deposits of the Mississippi basin. The Wabash series is represented in this county by two types, the silty clay loam and the clay.

WABASH SILTY CLAY LOAM.

The Wabash silty clay loam occupies flat areas in the Mississippi bottoms bordering the Wabash clay. It is higher than the clay type and consequently somewhat better drained. The surface soil is a dark-brown silty clay loam which grades at about 15 to 18 inches into a brown heavy silty clay loam to clay. The lower substratum is mottled with yellow and drab. Like the Wabash clay, this soil puddles if disturbed when wet, and forms clods on drying. It is therefore difficult to work, especially during seasons of heavy rainfall.

This soil is naturally productive, but in places it is in need of drainage, which is probably best effected by the use of tile, because of the flat surface. Where well drained it is an excellent soil for small grains. Corn also does well. All of the type is in cultivation.

The Wabash silty clay loam includes a small area of Wabash fine sandy loam, which is too small and irregular to be shown separately on the map.

WABASH CLAY.

The surface soil of the Wabash clay is a dark-brown to nearly black clay, which has a crumbly structure when dry. It is underlain at about 6 inches by a plastic clay which becomes lighter brown with increase in depth. In places at about 30 to 36 inches the subsoil is mottled yellowish brown and ochereous yellow or drab. The material below 4 or 5 feet is usually sandy.

This type occupies flat areas in the Mississippi bottoms. In places it is rather poorly drained. The heavy clay surface material makes it difficult to work, and the type can not be plowed when wet, as it forms clods which are difficult to pulverize. The type is locally known as "gumbo." Where well drained this is one of the strongest soils of the county. The incorporation of organic matter improves the physical structure of the soil, giving it better tilth.

The Wabash clay is very rich in plant food constituents, and produces large yields of wheat, corn, oats, and grass. It is a particularly good wheat soil. Clover does well on the better drained areas. Practically all of the type is in cultivation.

VICKSBURG SERIES.

The soils of the Vicksburg series are brownish and prevailingly silty. The subsoils are brown or dark brown and have a friable structure. The material represents alluvial deposits derived from brown loess or

such soils as the Memphis and Knox. Along some of the smaller streams much of the material is of colluvial character or partly colluvial, having been moved only a short distance from the adjacent slopes and lateral drainage ways; but the typical soils occur as first-bottom frequently-overflowed alluvium. Along some streams inundation is not always from the central or main stream channels, but from the smaller tributaries. In this county only one type of the Vicksburg series is mapped, the Vicksburg silt loam.

VICKSBURG SILT LOAM.

The Vicksburg silt loam consists of a brown mellow silt loam which changes but little with increase in depth, except that grayish rusty brown mottling is sometimes encountered in the lower subsoil.

The type occurs along the outer edge of the Mississippi bottoms at the foot of the uplands, near streams issuing from the Knox silt loam. It consists mainly of material washed from the Knox silt loam. The type also includes small, unimportant areas in which the subsoil resembles those of the Wabash soils.

The Vicksburg silt loam is a well-drained type, which is easily cultivated. Corn is the principal crop grown and yields of 75 bushels per acre are frequently obtained. This soil is also well suited to small grains and alfalfa.

All of the Vicksburg silt loam is in cultivation, but owing to its limited distribution in the county it is a comparatively unimportant type.

The results of mechanical analyses of samples of the soil and subsoil of this type are given in the following table:

Mechanical analyses of Vicksburg silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
343127.....	Soil.....	0.1	0.2	0.1	0.6	11.2	78.2	9.1
343128.....	Subsoil.....	.0	.2	.2	.8	16.9	71.3	10.6

JUDSON SERIES.

The Judson soils range from brown to dark brown in color. They occur at the foot of bluffs or rather steep slopes between the upland and the bottoms, and are usually deeper than the soils on the upland. They are not subject to overflow and suffer but little from erosion. The organic-matter content is high. These soils are formed principally through colluvial action. In places they are composed of wash from glacial drift, and in some of the more southern areas in the loessial belt they are derived through colluvial action from the loess, slightly modified in places by a mixture of the underlying glacial

till or residual material from rock exposures occurring in the higher lying bluffs. The Judson series is represented in Perry County by a single type, the Judson silt loam.

JUDSON SILT LOAM.

The Judson silt loam is a dark-brown, mellow silt loam, occurring on the gentler slopes between the bottom lands of the Mississippi River and the uplands. It consists of colluvial material from the Knox silt loam, with some admixture of soil derived from the white cherty limestone underlying the Knox.

The Judson silt loam is a good agricultural soil. In a few places the slope is too steep for satisfactory cultivation. The type is very limited in extent in this county and is therefore relatively unimportant.

SHARKEY SERIES.

The Sharkey soils are yellowish brown to drab, with mottled rusty-brown, bluish, drab, and yellowish subsoils of plastic structure. In the slight depressions where water stands for a large part of the year organic-matter accumulations impart a nearly black color to the soil. The series contains a high percentage of clay in both soil and subsoil. These soils occur as bottom lands subject to overflow from the Mississippi River. The component material was mainly deposited some distance back from the river by quiet water. On drying the soil cracks readily, forming small aggregates, and this condition gives rise to the local name, "buckshot land." These soils are poorly drained and subject to annual overflow. Only one member of the Sharkey series, the clay, is recognized in Perry County.

SHARKEY CLAY.

Typically the Sharkey clay consists of a mottled rusty-brown and dark-drab, heavy plastic clay, passing below into blue, sticky clay frequently mottled with yellowish brown. The soil cracks on drying. Near the foot of the upland slopes there is in places an overwash of brown silt loam.

The Sharkey clay occupies depressed areas in the Mississippi bottoms. It is a lower lying soil than the Wabash. Until drained by a recently constructed canal, this type comprised swamp land which was frequently covered with water. The forest growth consists of hackberry, ash, pecan, willow, sweet gum, shellbark hickory, sycamore, and water oak. This soil is representative of the "buckshot" land typically developed in the Mississippi bottoms to the south.

This type has been developed by accumulations of silt and clay in areas where water has stood for a considerable length of time, allowing

the finer particles carried in suspension to settle. The surface soil in places has been modified by the accumulation of organic matter. Most of the type represents an old channel of the river which has gradually been filled by soil material during times of flood.

The greater part of this type is in need of drainage. A small part is now in cultivation, and excellent yields of corn are secured. It is doubtful whether large yields can be produced in seasons of normal rainfall, unless adequate drainage is provided. This is a strong soil, which with proper drainage ranks among the best of the bottom types. The difficulty of cultivation, however, makes this type, like the heavy Wabash soils, somewhat less desirable for farming than those of lighter texture.

SUMMARY.

Perry County, Mo.—area 462 square miles, or 295,680 acres—lies within the Ozark border, in the extreme eastern part of the State, along the Mississippi River and about 60 miles south of St. Louis.

The county includes two broad physiographic divisions, the upland and the lowland, the former comprising about seven-eighths of its total area. The topography of the upland varies from rolling to hilly. The lowland, consisting mainly of the Mississippi bottom, is a generally smooth plain.

All the county is drained by tributaries of the Mississippi River.

Perry County was first settled about 1790 and was organized in 1821. Its population is reported in the 1910 census as 14,898. Perryville is the county seat and largest town, with a population of 1,708. About three-fourths of the present population is of German extraction.

The railroad facilities are good in the eastern part and poor in the western part of the county. The wagon roads are generally good.

The climate of Perry County is well suited to general farming. There is a growing season of approximately six months. The mean annual precipitation is about 46 inches.

The agriculture of the county prior to about 1880 consisted of raising live stock on the unoccupied land and the cultivation of grain. Since that time grain farming has become the most important form of agriculture, and until recently the raising of live stock has received less attention. Interest in stock raising is again awakening. Corn and wheat are the principal grain crops. The wheat is largely sold, and the corn used locally in feeding. The tendency is to increase the acreage in corn and forage crops, decreasing the acreage in wheat.

Hog raising is the principal stock industry, although dairying is becoming of greater importance. No systematic breeding of stock is practiced. There are several successful commercial orchards in

the county, and apples and peaches are grown on practically all the farms. Irish and sweet potatoes are grown to some extent.

The methods of farming are generally good. Some form of crop rotation is usually practiced. In general the present system of grain farming does not tend to maintain the productiveness of the soils, and it is necessary to exercise care in maintaining and increasing the organic-matter content, through the growing and plowing under or feeding of leguminous crops and the proper use of manure. It is quite probable that investigation will show large areas of soil needing lime, which may account in part for numerous clover failures.

Land values range from \$12 an acre for unimproved, hilly areas to \$125 an acre for well-improved land. About three-fourths of the farms are operated by the owners. The farms average about 133 acres in size. Labor is cheap and easily obtained. Labor-saving machinery is used wherever possible. The general tendency in Perry County is toward a more systematic and scientific agriculture.

Twenty soil types, representing eleven series, are recognized in Perry County. The uplands include four series, the Hagerstown, Clarksville, Tilsit, and Knox. The alluvial soils derived from wash from the upland types are classed with the Huntington, the Robertsville, and the Vicksburg series. The Mississippi alluvial soils are the Sarpy, Wabash, and Sharkey. The Judson soil consists of colluvial material from the Knox.

The upland soils of the county are by far the most extensive and are in general well adapted to general farming. They are residual, largely from limestone, excepting the loessial soil, the Knox silt loam, which is believed to be of eolian origin from glacial material.

Alluvial soils are developed along all the streams, mainly in the Mississippi Valley. These bottom soils are extremely productive. The river bottoms are protected from overflow by levees.



[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

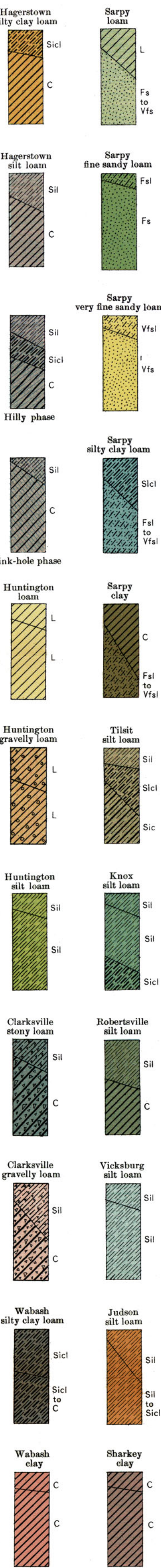
[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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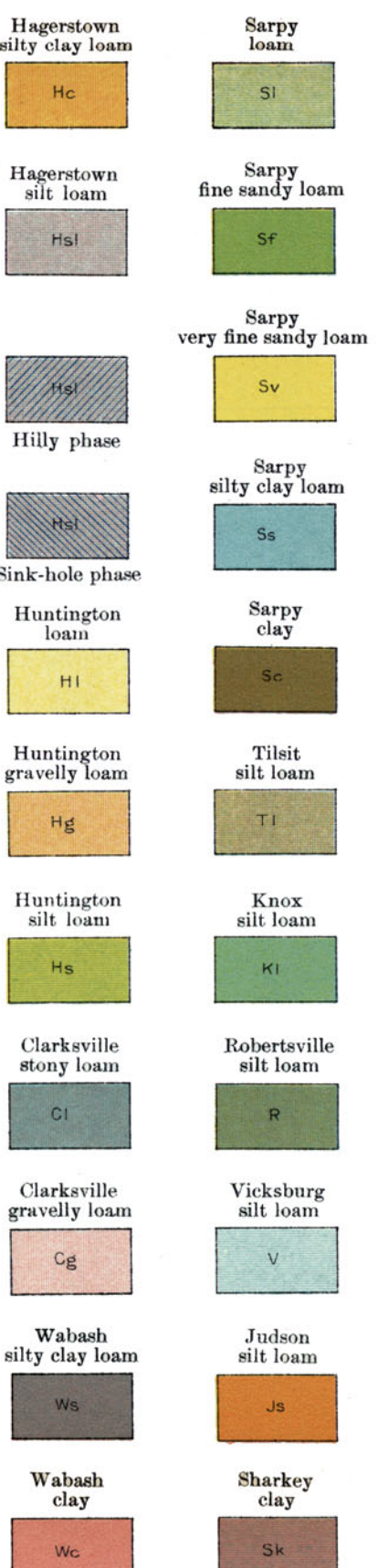
SOIL
PROFILE
(3 feet deep)



LEGEND

L—Loam
Fa—Fine sandy loam
Vfa—Very fine sand
Si—Silty loam
SiCl—Silty clay loam
C—Clay

LEGEND



CONVENTIONAL
SIGNS

